ROCKS AND MINERALS

A Magazine for Mineralogists, Geologists and Collectors . . .

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THE ROCKS AND MINERALS ASSOCIATION

PEEKSKILL, N. Y.

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Organized in 1928 for the increase and dissemination of mineralogic knowledge

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To stimulate public interest in geology and mineralogy and to endeavor to have courses in these subjects introduced in the curricula of the public school systems; to revive a general interest in minerals and mineral collecting; to instruct beginners as to how a collection can be made and cared for; to keep an accurate and permanent record of all mineral localities and minerals found there and to print same for distribution; to encourage the search for new minerals that have not yet been discovered; and to endeavor to secure the practical conservation of mineral localities and unusual rock formations.

Ever since its foundation in 1928, the Rocks and Minerals Association has done much to promote the interest in mineralogy. It has sponsored outings, expeditions, formations of mineralogical clubs and the printing of many articles that have been a distinct contribution to mineralogy.

Those of our readers who are members of the Association can rightly feel that they too were sponsors of these many achievements that have helped to give mineralogy a national recognition. Among your friends there must be many who would like to have a part in the Association's work—to share with you the personal satisfaction, the pleasure, and the benefits of membership. Will you give your friends this opportunity to join the Association by nominating them for membership?

Each new member helps to extend the Association's activities—helps to make your magazine larger, better, and more interesting, and above all assists in the dissemination of mineralogical knowledge.

Some advantages of memberships: All members in good standing receive:

(1) **Rocks and Minerals**, a monthly magazine, (2) A member's identification card that secures the privileges of many mines, quarries, clubs, societies, museums, libraries. (3) The right to participate in outings and meetings arranged by the **Association.** **(4) The right to display a** certificiate of membership and to place after their names a designation indicating their membership or to advertise membership on stationery, etc. (5) The distinction and the endorsement which comes from membership in the world's largest mineralogical society.

Mineralogical clubs which subscribe for **Rocks and Minreals** also become affiliated members of the Rocks and Mineral Association and enjoy all the advantages which such an affiliation affords.

A number of clubs hold membership in the Association, participate in the annual outings, and co-operate in many ways in furthering the aims and ambitions of the Association.

Affiliation with the world's largest mineralogical society cannot fail to increase membership, enlarge circles of acquaintanceship, and stimulate a keener interest in mineralogy.

A list of affiliated clubs will be found among the back pages of the magazine.

Rocks and Minerals

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Edited and Published by
PETER ZODAC

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ROCKS and MINERALS PEEKSKILL, N. Y., U. S. A.

The Official Journal of the Rocks and Minerals Association

Chips from the Quarry

WE VISIT A MEMBER

Some days ago, Carl Klein, of Hudson, N. Y., invited us to join him on a trip to a new chrysoberyl locality somewhere north of Albany, N. Y. Having visions of returning home with magnificent crystals of huge proportions, we induced R. Emmet Doherty, our good-looking president, to accompany us (not that he would share in any of the finds but simply to help us load the crystals into his car) and we rushed up to Hudson making the trip of 70 miles in 55 minutes flat.

But alas and alack, genial Carl made no effort to even leave the house upon our arrival and our pleas and entreaties to get going passed over his head like water off a duck's back. We were forced to cool our heels in his large and spacious house. The trip, however, was not altogether a wasted one because Carl has a large array of very fine specimens, many of which are truly marvellous for quality and crystallization, and all LABELLED, and we simply made ourselves at home because that is the way he wants all his friends to do when they call on him. A large collection of mineralogical literature, an unusually fine fluorescent exhibit, many gems, an up-to-date laboratory, a cellar and a garage bulging with minerals (most of which were duplicates) and—but why say any more when it can all be summed up in a short sentence—we simply ran riot over the place. To top it all, a most delicious dinner had been prepared for the occasion by gracious, soft-speaking Mrs. Klein and her very friendly mother, Mrs. Kenny, with lots of eats—and how we did eat (we bet that now if they were forced to do so they would rather pay our board than feed us)—climaxed a most enjoyable, delightful and happy day.

But there was something phoney about the chrysoberyl locality as Carl simply ignored the subject all day. Even Mrs. Klein, who always accompanies Carl on his trips and on whom we bank heavily for details regarding localities, refused to commit herself in one way or another. And though we searched diligently, almost straining our eyes in the process, we failed to catch even a glimpse of a chrysoberyl in Carl's collection or among his duplicates. Yes, something was wrong somewhere and someday we will learn the truth. Even the 100 or more pounds of very fine minerals, from localities (some new to us) which he "forced" us to take (our car could not hold more) will not bribe us to drop our investigation. Someday we will either find that chrysoberyl locality or else learn why it does not exist. Does not scripture say: "That which is hidden shall be revealed?"

Peter Zodac

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ASBESTOS

By O. JAY MYERS

Asbestos has been known since ancient times, although not until late in the nineteenth century has there been an increasing incessant demand for it. The outstanding properties of this mineral are its fibrous structure and its fire-resistance. Asbestos is found in small quantities all over the world, but large deposits are known to exist only in Africa, Canada, and Russia. Most asbestos occurs, geologically, as an alteration product of some sort of a serpentine rock. The cost of quarrying this mineral increases with depth and more and more producers are turning to underground methods of mining. Asbestos is used in many industries, the heaviest demand coming from the automotive field. The reserves of this valuable mineral are, at present, unlimited. Over twenty million tons of undeveloped asbestos are known to exist.

Chapter 1
INTRODUCTION

A non-metallic mineral whose total value has annually, for ten years, exceeded $60,000,000 certainly demands the attention of not only the scientist, but also, the layman. Asbestos is a strategic mineral in world affairs.

Its peculiar fire-resisting properties and flexibility are the result of natural processes involving complex physical and chemical phenomena which cannot be duplicated in the laboratory. Mr. Bowles has shown that "the manufacture of synthetic asbestos seems to be farther from attainment than the manufacture of synthetic diamonds" 1/.

In both ancient and modern Greek, the word "asbestos" means "quicklime." The mineral known to the ancients as "amiantos" is now called "asbestos" by us.

The Romans believed asbestos to be of vegetable origin. They used it in making cremation cloths for funeral pyres, for "perpetual" lamp wicks at their altars, and for unburnable cloth.

The French word for asbestos is "pierre á coton," literally translated in English to "cotton-stone." The definition accepted by the United States Bureau of Mines 2/ is, a group of minerals of differing chemical compositon, but having a common fibrous structure on which their commercial value depends."

The Greek word "asbestos" also means unquenchable." This term might easily be applied to the demand for this mineral. Since 1860, the need for asbestos has continuously grown and producers have never been able to meet the incessant demand of manufacturers.

Asbestos was first discovered in Thetford, Quebec, Canada, after this territory had been ravaged by a disasterous forest fire. The silky veins of the mineral were found by an old prospector in the winter of 1862. The first commercial production came from that district in 1878. In 1930, 242,112 tons of asbestos were shipped from Thetford. This shipment was valued at $8,390,163.

Chapter 2
MINERALOGY

In the study of mineralogy, three distinct minerals are classified under the

1/ Bowles, Oliver, Asbestos, a stragetic mineral: Mining and Metallurgy, vol 19, no. 382, p. 442, 1938.

2/ Bowles, Oliver, Asbestos, general information; U. S. Bur. Mines Inf. Circ. 6817, p. 12, 1935.

one term "asbestos". These minerals are anthophyllite, amphibole, and serpentine. Their approximate chemical compositions are, [3]/ anthophyllite $(Fe, Mg)SiO_3$, amphibole $(Ca(Mg,Fe)_3(SiO_3)_4)$, and serpentine $(H_4Mg_3Si_2O_9)$.

Anthophyllite is called "amphibole schist" in Georgia where it is commercially produced. It is not a very important source of supply of asbestos.

Amphibole is an important mineral of asbestos. Classified in the amphibole group are a series of minerals including tremolite, actinolite, "mountain leather," crocidolite, and amosite.

Tremolite is an non-commercial variety of amphibole and it is hardly ever mined. Recent study has shown the ancient deposits in Rome to be chrysotile, a variety of serpentine, and not tremolite as formerly believed.

Actinolite is mined in some parts of the world, but it is not very important in the world's asbestos market.

"Mountain leather" is an unusual type of amphibole with no practical use.

In South Africa there are large deposits of the beautiful blue amphibole known as crocidolite $(NaFe(SiO_3)_2FeSiO_3)$. Also in South Africa, deposits of amosite, a variety of crocidolite, are found. Both of these minerals are highly prized by manufacturers of asbestos materials because of the exceptionally long fibres of mineral suitable for spinning into cloth. The longest asbestos fibres ever found came from crocidolite and measured eleven inches.

The principal asbestos of commerce occurs in a serpentine rock found at Thetford, Quebec. Production from serpentine also comes from Africa, Cyprus, Russia, and the United States. There are three recognized varieties of serpentine asbestos: picrolite, soapstone, and chrysotile.

Picrolite and chrysotile are so different in appearance that they seem to be two distinct minerals. Where these two classes of serpentine occur together, their mutual hardness ranges from 2.6 - 3.5 on Moh's scale of hardness [4]/. They are usually found in a massive state, dark black to light green, and having a waxy luster and a greasy feel. Chromite $(FeCr_2O_4)$ is usually found associated with this aggregation of minerals. In Vermont, this mixture of picrolite and chrysotile are quarried for decorative stone and sold under the name of "verde antique."

Where picrolite occurs with extensive deposits of valuable chrysotile, it is called by the miners "bastard asbestos" probably because it is so hard to distinguish from the chrysotile and hinders proper milling of the commercial asbestos.

Chrysotile is the variety of serpentine which is generally called asbestos. Chrysotile must be tough, infusible, flexible, fibrous, and acid-resisting before it can be commercially used. Many deposits ıulfill some of these prerequisites, but before they can be worked economically, they must meet all five of these standards. When the chrysotile deposits in Canada were first worked, it was found that it was quite difficult to produce cloth from this abestos found in this locality. The asbestos could not be spun because of "the difficulty arising from the peculiar formation of the fibres, which, possessing perfectly smooth surfaces, and being much less elastic than fibres of organic origin, slip past each other when subjected to the spinning process" [5]/. These difficulties were soon overcome by pre-milling treatment. The hardness of chrysotile ranges from 3.0 - 3.5 and its specific gravity is between 2.2 and 2.3. It is light to dark green, very acid-resisting, and will easily stand temperatures above 3,000 degrees Fahrenheit [6]/.

Soapstone is a species of massive talc, an alteration product of serpentine. It is very soft, having a hardness of from 1.0 - 1.5 on Moh's scale of relative hardness. Its specific gravity averages 2.75. Its commercial applicability depends on its purity. It is a non-corrosive material and has an extremely low coefficient of expansion. It is unaffected by both mois-

[3]/ Bowles, Oliver, idem. p. 2.
[4]/ Phillips, A. H., Mineralogy, pp. 430-435, New York, The Macmillan Company, 1928.

[5]/ Ross, J. G., Chrysotile asbestos in Canada: Canada Dept. Mines, no. 707, p. 18, 1931.
[6]/ Phillips, A. H., op. cit., pp. 499-500.

ture and chemical fumes. It has many practical uses, such as laboratory table tops, as well as ornamental ones.

In conclusion, asbestos is, chemically, a complex hydrated silicate of iron, lime, and magnesia. The many asbestos minerals all depend upon flexibility, infusibility, and length of fibre for their economic uses.

Chapter 3
GEOLOGY

Geologists have been disputing the origin of chrysotile asbestos for many years. During the last decade two main theories have been brought forth. The first theory is that asbestos is a deep-seated alteration product of a basic igneous rock; the second theory is that the asbestos is a secondary mineral which has developed in existing fissures in serpentine. Mr. Bowles 7/ has stated that chrysotile asbestos is derived "from an alteration of olivine to serpentine with subsequent prismatic crystallization." This thesis has been most widely accepted by the geologists of the day. Serpentine must have undergone intense contact and regional metamorphism before asbestos could have been produced. Replacement probably took place along vein walls rather than fissure filling from magmatic sources. Cross fibre seems to be governed by the width of the vein. In the a recent publication, Mr. Cooke 8/ has made an excellent attempt to explain the complex origin of chrysotile asbestos. "Asbestos formed where the temperature was at least as high as necessary for magnetite crystallization and massive serpentine filled the fissures wherever the temperature dropped. Granite intrusions . . . . are considered the thermal conditioning agents. Certainly, authors who follow the fissure-filling hypothesis, in contrast to the simple alteration-replacement origin, would agree that both serpentine and water existed in the solution when it began to deposit asbestos." The present asbestos of commerce was at one time a heavy, basic, igneous rock subsequently converted to serpentine by intense metamorphism.

There has been no satisfactory explanation given for the origin and development of the fibrous structure associated with asbestos. Mr. Bowles says 9/ "the formation of numerous fissures was followed by an infiltration of solutions containing serpentine which crystallized in the fissures. The solid masses of parallel fibres grew with such vigor that they forced the walls apart, and thus the cross-fibres of asbestos were formed."

The origin of crocidolite has been universally accepted. Deposits of this asbestos mineral have been traced from a zone of metamorphosed rock to an undisturbed zone where they inevitably die out. Crocidolite has originated as an alteration product of soapstone during regional metamorphism.

To summarize, we may say that all asbestos has originated in one way or another through the dynamic earth stress affecting igneous rocks.

More information is known about the geology of the chrysotile deposits of Thetford, Quebec, than of that of any other large producing area. Here the deposits are now being quarried at a depth of 450 feet. Diamond drilling has proved that these asbestos deposits exist at least to a depth of 1,700 feet where the grade of fibre seems to be richer than that being mined now. The asbestos which is found at Thetford is commonly called 'vein-fibre." The asbestos seems to have grown in such a manner that the fibres are at right angles to the enclosing walls. Long bands of asbestos traverse the country around Thetford for miles and miles. The veins range in size from ¼ to 5 inches in width. They assume a ribbon structure in the rock, and where this peculiar structure is the widest, the best commercial deposits of asbestos may be found. Here, also, where the veins are thick, it is comparatively easy to separate the fibrous asbestos from the country rock. The ribbons of asbestos seem to be flanked on both sides by seamy partings in the serpentine country rock. In the

7/ Bowles, Oliver, Asbestos, general information: op. cit., p. 4.

8/ Cooke, H. C., Thetford, Disraeli, and eastern half of Warwick map areas, Quebec, Canada Geol. Survey Mem. 211, p. 60, 1937.

9/ Bowles, Oliver, Asbestos, a strategic mineral: op. cit., p. 444.

Thetford district, the veins run parallel to these seamy partings. These microscopic lines are invisible to the naked eye when the asbestos is freshly mined, but after being exposed to the atmosphere, they take on a blue-white tinge and are easily detected.

Chrysotile fibres, in their natural state are yellow, green, and blue; after milling they are pure white. Canadian chrysotile is noted for its flexibility, its silkiness, and its great tensile strength.

Besides the ribbon, or vein-fibre, asbestos occurs in slip planes in the massive serpentine at Thetford. This asbestos is simply called "slip-fibre" asbestos. This type of asbestos is usually avoided by producers because the slip-fibre is brittle, difficult to free from the country rock, and troublesome in milling.

Asbestos fibres are graded on their lengths, and asbestos of the same quality, but of different lengths range in price from $20.00 to $500.00 per ton. The best asbestos is found in massive serpentine rocks where the fissures are widest and filled with chrysotile.

Chapter 4

GEOGRAPHICAL DISTRIBUTION AND WORLD PRODUCTION

The latest verified calculations for the world production of asbestos are for the year 1932. I have investigated several sources of information and find that, since Russia is still an unknown quantity, the total figures for world production are not very accurate.

The most important producers of asbestos are: Africa, Canada, and Russia, The following table was copied from one of the best papers ever written on asbestos[10]/. Notice the discrepancy existing between the figures for production and exports of Africa for this year (1933). All calculations are in tons.

Country	*Production*	*Exports*	*Consumption*
Canada	146,700	142,355	4,345
Russia	63,655	13,030	50,625
Africa	35,463	38,533	——
United States	2,882	1,530	123,103

[10]/ Bowles, Oliver, Asbestos, general information: op. cit., p. 15.

Between the years 1933 and 1934, a great change came over the asbestos industry. In 1934 the African deposits began to boom and production from that part of the world increased greatly. Canada's output has steadily decreased, with the exception of the year 1929, from 1924-26 when she produced over 80% of the world's supply. In 1930, Canada produced 50% of all asbestos on the world's markets. In 1932, she did produce 75% but most of this asbestos was of very low, inferior grade. During this same year, Africa's output was only 22% of the total yield. Two years later, in 1934, it was a different story. Africa produced 54%, Russia 24%, and Canada only 22%.

The largest consumers of asbestos are the United States, Russia, England, France, and Germany. One of the most vital facts which control the asbestos industry is that the principal consuming countries produce no asbestos, and the principal producing countries, with the exception of Russia, consume no asbestos. Russia is the only country which is self-sufficient in asbestos and uses her output. Most of all abestos mined finds its way into the channels of international trade. Three out of the four largest producers of asbestos are controlled by British capital.

Several factors caused the fall of Canada from her pedestal, the most important being competition from Africa. The Canadian deposits are situated in a belt seventy miles long and six miles wide. The amount of fibre won from the material quarried is very small. During 1929, 6,208,790 tons of rock were hoisted from Canadian quarries and only 311,204 tons were milled. This means that the average recovery was only 6%, and over 90% of the asbestos milled was non-spinning fibre. The price per ton of No. 1 Crude Fibre during the world war was as high as $3,000.00 per ton; in 1931 the price was quoted at $450.00 a ton. Even now the price of asbestos is so high that Russian and African competition is encouraged. Recently, all of the Canadian producers have banded together and consolidated in an effort to reduce

the cost of asbestos and eliminate African competition. Although the Canadian mines still supply a substantial quantity of spinning fibre, foreign competition is an ever-increasing problem.

The rise of African asbestos production has been phenomenal. It has grown from fifty-five tons in 1908 to over forty-two thousand tons in 1929. It is interesting to note that asbestos in now second only to gold in the mineral value of African exports. Southern Rhodesia alone produced asbestos worth 555,993 pounds sterling during the year of 1933.

The asbestos occurs in deposits very similar to those of Canada. The greatest producing areas are found in Southern Rhodesia. Here, the Bulawayo district is the most important where the production of crude asbestos fibre averages about 1,200 tons a month. According to geologists, the deposit originated from an alteration of dunite under the influence of a granite intrusion. The veins range from six to three inches in thickness and contain over 30% of long, Crude No. 1. fibre. The "shorts" are discarded because transportation is so expensive. Excellent new mills have been constructed in this district. The deposits are wholly owned by British capital and are consolidated under one company which exports the products to Europe and the United States through Portuguese East Africa. The ore reserves of the Bulawayo district have been estimated at over seven million tons

Another important asbestos deposit in Africa is found at the Cape of Good Hope, Union of South Africa. In 1929 over 33,000 tons were produced, the ore consisting for the most part in crocidolite or "blue" asbestos. The asbestos is found in banded limestone and is known to be of sedimentary origin. These deposits are similar to ones found in the United States. Sixty percent of the fibres are more than one-inch long. Amosite has been mined here with the fibres existing as long as 11 inches in some seams. The asbestos is mined from pits as well as underground. The recovery rate is much higher than the Canadian producers have been able to attain. The reserves of this district are tremendous, but developments has been seriously hindered by the transportation problems. It is over 130 miles through deep jungle to the nearest railway. The semi-precious "tiger's eye" gem is mined here. It is a variety of silicified crocidolite.

If Russia were to concentrate on her asbestos production, she would probably be able to extract more asbestos from her territory than any other country in the world. Asbestos has long been known in the Ural Mountains in a deposit situated 45 miles northeast of Sverdelosk. Here is found a serpentine intrusion ten miles long and one mile wide in which the asbestos occurs. The serpentine mass is bounded by shales and schists on the west and granite on the east. The central parts of the ellipsoidal core contain the highest percentage of fibre, whose high iron content makes it unsuitable for many purposes. A shallow overburden has allowed the weathering by rain and snow to spoil a great deal of the fibre. The percentage of commercial asbestos is about the same as Canada.

A reserve of over three million tons is known to exist within fifty feet of the surface. All of Russia's asbestos deposits have been taken over by the State and worked by the Uralsabest Trust since 1918. In 1931, 64,000 tons were produced, but, since Russia consumes all her asbestos, this production has no affect on the markets of the world.

The United States has never gained importance as a producer of asbestos. Only from 1½ to 3% of the asbestos required in the United States is mined in this country. About three thousand tons were produced in 1933 from many scattered districts throughout the United States.

Opposite Grand View on the rim of the Grand Canyon of the Colorado River in Arizona, one may see a domestic asbestos deposit. Here the asbestos is an alteration product of a dolomite limestone. Geologists think that this metamorphism was caused by a diabase intrusion. Cross fibre veins may be seen in the limestone near the contact surfaces of the

diabase, where the asbestos seems to be associated with nodules of serpentine. Although the Arizona deposits represent one of the largest producing fields in the United States, the actual asbestos-bearing zone is very small and must be mined by underground methods. The mineral mined is chrysotile, of excellent quality, but it is intimately associated with the harsh slip fibre variety which makes milling difficult. Arizona asbestos makes excellent insulating material.

California and Montana have both produced a small amount of asbestos, but the fibres from the deposits found in these states are usually not only small, but also very brittle. Small production of chrysotile comes from Wyoming, Oregon, and Virginia.

Georgia has been the most consistent producer of amphibole asbestos in the United States. Here, in several parts of the state, mass fibre anthophyllite is found and over 75% of the rock may be quarried for fibre. Georgia has very limited reserves of anthophyllite and most of the high grade deposits have already been exhausted, since most of the best asbestos is found near the surface where weathering has made the fibres flexible. Georgia asbestos is used in fireproof paints, insulating material, and pipe covers.

Idaho and Maryland have produced a little asbestos during the last few years, but there does not seem to be any future to production from these two states.

The leading asbestos producer in the United States has been Vermont, but her output has dropped off considerably of late. Chrysotile is found in Vermont, and this asbestos mineral lies in a deposit which probably represents a southwest extension of the Canadian, Thetford belt. Narrow belts of small three-quarter inch slip and cross fibre are found all over the countryside. During the years 1909-1911 Vermont was one of the largest asbestos producers on the continent.

Samples of chrysotile were brought from Alaska in 1932 by some prospectors who had discovered a small occurrence of asbestos on the Kabuk River. No work has been done on these deposits because the asbestos was of the inferior slip fibre variety[11]/.

The position of the United States in production and consumption of this vital product is a very precarious one. The bill before Congress to barter cotton and wheat surpluses for necessary war materials would surely include asbestos as one of the "vital" non-metals. A chart showing the production of the United States in comparison with its imports has been prepared by Mr. Tyler[12]/. Notice that as the uses for short fibres increase, the cost per ton of asbestos drops.

Year	*U. S. Production (Tons)*[1]	*Value*	*Imports*	*Consumption*
1910	3,693	$ 68,357	59,235	62,928
1915	1,731	$ 76,952	93,566	95,297
1920	1,648	[2]$678,231	166,943	168,591
1925	1,258	[3]$ 51,700	229,411	230,669
1930	4,242	[4]$289,284	207,910	212,152
1932	[5]3,559	$105,292	95,047	98,606
1937	(6)	(6)	(7,8) 14,326	(6)

1 Tyler, P. M., idem.
2 Price per ton of asbestos very high because excessive war demand depleted supply on hand.
3 Use of short fibre increased and price per ton dropped.
Automobile demand increased price.
5 Depression caused shutting down of local mines.
6 No figures available.
7 Bowles, Oliver, Asbestos, a strategic mineral: op. cit. p. 442.
8 Represents only Crude No. 1.

Although Italy is the cradle of the asbestos industry, her production has never seriously affected world markets. Before the discovery of the Canadian deposits, much of the world's asbestos was exported from Rome, but asbestos production could hardly be termed an "industry." The maximum output for this country was about two thousand tons in 1929. Italian chrysotile is still being used in chemical laboratories because of its acid-resisting qualities.

Minor asbestos deposits are found all over the world. Argentina and Australia have small, rich deposits. In Austria (Germany), the chrysotile is mixed with

[11]/ Most of the information about production of asbestos from the United States and Alaska was drawn from Bowles, Oliver, Asbestos, domestic and foreign deposits: U. S. Bur. Mines Inf. Circ. 6790, 1934.
[12]/ Tyler, P. M., Consumption and prices of non-metallic minerals: U. S. Bur. Mines Inf. Circ. 6794, p. 34, 1934.

asphalt and concrete and used for road surfacing. Brazil, Bulgaria, China, and Cyprus also have asbestos quarries and mines. The Cyprus asbestos is transported to the Mediterranean sea by a ropeway eighteen miles long. Cyprus produced 1,158 tons during the first six months of 1933. Finland, India, Iceland, Mexico, Newfoundland, New Zealand, Philippine Islands, Portugal, Spain, Switzerland, and Turkey all produce at least a few tons of this valuable mineral, but the bulk of the world production still comes from Africa, Canada, and Russia.

Chapter 5

QUARRYING OF ASBESTOS

Most asbestos is produced by quarrying since this mineral is found at or near the surface of the ground.

Quarrying usually starts with the prospector uncovering a vein and then shovelling the valuable mineral out of the shallow pit he has dug. As the hole becomes deeper, it becomes necessary for him to use makeshift hoists to remove the ore from the floor of the pit. Today, the largest hoist buckets have a capacity of ten tons. The size and shape of the excavation is determined only after quarrying has progressed. It depends directly upon the strike and dip of the fibre-bearing zone.

The ground must first be stripped of its overburden after a large asbestos deposit has been prospected. This removal of overburden may be done by pick and shovel, mechanical scrapers, or by hydraulic methods. Mechanical scrapers and shovels are widely used, since the hydraulic method of stripping is not very satisfactory where the overburden is filled with numerous large boulders. In some places the topsoil is more than 85 feet thick, and besides the mere stripping of this topsoil, a ledge of clear bed rock must be kept around the pit to keep the overburden from falling into the quarry and discoloring the valuable fibre.

The quarries are usually elongate and irregular in outline, the width conforming in a general way to the ore-bearing fissures.

To blast the rock from the sides of the quarry, rows of holes are drilled vertically along the face of the ore. Long series of holes are then tamped with dynamite, the dynamite connected by a wire to a central cable, and the whole side of the quarry is fired simultaneously by an automatic blasting mechanism. Usually enough ore is broken in one blast to keep the men in the quarry working for several months.

While drilling, the holes are put down from two to five feet apart and set from ten to twenty-five feet back from the face of the quarry. The strength of dynamite used depends upon the type of rock drilled, but it never exceeds 75% gelatin. The charge is usually between thirty and fifty pounds of explosive per hole. Recent work has shown that if the holes are tamped with 75% gelatin at their base, and the remainder of the drill hole filled with 40% gelatin, best blasting results are obtained. The cost of blasting the rock from the quarry is about five cents per pound of finished asbestos.

After the rock has been blasted, the long loose fibres are gathered by pickers. Large blocks of broken ore in which long fibres are visible are blasted again and the valuable long fibres removed from the gangue. This handpicking process is one of the most important features of the asbestos industry. Pickers must be selected men and know their job well since none of these long fibres are recovered in the milling process. Profits from the industry depend directly upon the efficiency of this crude fibre selection.

The fine asbestos which results from the blasting in the quarry is collected and sent to a crushing unit. All material is raised from the bottom of the quarry by electrical or steam hoists. The long fibre is sent to the cobbing sheds, the medium fibres are sent to the mill, and the fine fibres are trammed to the crusher. Waste is disposed of as far away from the quarry as possible so that it will not interfere with future operations. Quarrying costs average forty cents per pound of finished fibre.

Since the future of the asbestos industry seems to lie deeper and deeper under

the soil, this mineral will probably be mined instead of quarried as time progresses. Mining asbestos has many advantages over quarrying . In mining asbestos, much time is saved which would be lost in quarrying because of inclement weather, flooding by torrential rains, and high pumping costs are cut in half. Quarrying costs increase with depth, this is not necessarily true in mining this mineral because rich veins may be followed instead of having to hoist much waste.

Shrinkage stoping has been started in Thetford, Quebec. The ore is drawn through chutes directly into box-cars trammed by hand or locomotive. The Arizona mines have started a block-caving method much like those used in the copper mines of that state[13]/.

Chapter 6
MILLING AND DRESSING

There are two different methods of preparing asbestos for market, hand dressing and mechanical milling.

Hand dressing of crude fibre consists in cobbing the asbestos clean of the rock and then grading the asbestos. The long separated fibre is dried on steam pipes in the cobbing sheds near the quarry. When dry, it is gathered by the cobbers who work the asbestos on a flat stone or "plate." The workers strike the asbestos with a cobbing hammer which weighs from three to seven pounds. Under continuous beating, the asbestos fibres are freed from the gangue until a perfectly clean mass of threads is left. The fibre is then graded according to length and asbestos of the same quality, but different lengths, range in price from twenty to five hundred dollars per ton. The graded fibres are then placed in labelled boxes, screened, and shipped to manufacturers. The refuse from the screens is added to the mill feed.

Asbestos was economically treated by mechanical means as long ago as 1896. Today the largest mills treat about 250 tons of asbestos per hour. Each quarry has to be equipped with its own type of mill, since the asbestos fibres are very variable from place to place.

The general milling practice follows this method. The milling rock is hauled from the quarry and dumped into a sluice which feeds the primary crusher. A standard jaw crushed is usually used in the breaking of the ore. The crushed rock is passed over a picking belt after leaving the crusher. The refuse is separated from the fibre by hand pickers. The belt carries the fibre and gangue to a drying mechanism and then to storage bins. The fibres which reach the storage bins are about 2½ inches wide, but very short.

The actual milling process now begins. These fragments of ore and gangue about 2½ inches square are crushed to about 100 mesh. The fibre is then opened and "fluffed"; the fine sand and debris, screened away. The asbestos is then screened, sized, and "fiberized." A fiberizer is a piece of machinery especially designed for use in asbestos mills. Its purpose is to open the asbestos and refluff it in such a way that it can be lifted from the conveyor belt by suction. A new fiberizer has been described by Mr. Ross[14]/. "A Jumbo consists of a cylindrical shell set in a horizontal position, lined with sectional steel plates, and fitted with cast-iron ends. A horizontal shaft on which are beaters revolves at a fixed speed. These beaters are made in two parts, a permanent arm bolted to the shaft, and a manganese-steel hammer bolted to the end of the arm." This machine fluffs the fibre by mechanical beating and also prevents unnecessary cutting of the fibre. An iron hood covers a screen on which the fibre passes after leaving the fiberizer. A vacuum is created in this hood by air suction from a multi-blade fan. The fibre is lifted into this hood, the tailings are sent through the milling process once again. The fibre which has been sucked into the hood continues down a long pipe to a collector where it is bagged and ready for manufacture.

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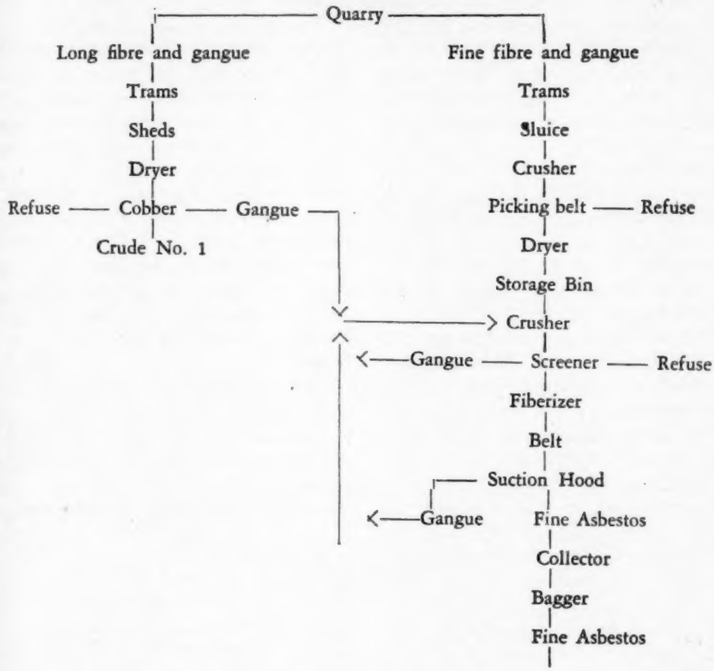
[13]/ For more information on the underground mining of asbestos see, Canada Mining and Metallurgical Bull., no. 264, pp. 184-218, 1934, Also, Eng, and Min. Jour., vol. 134, pp. 375-381, 1933.

[14]/ Ross, J. G. Chrysotile asbestos in Canada: Canada Dept. Mines, no. 707, p. 18, 1931.

FLOW SHEET



Chapter 7
MANUFACTURE AND USES

The outstanding properties of asbestos are its fibrous structure and its fire resistance. If the finest silk threads and a strand of Thetford asbestos were to be examined side by side under a microscope, they would appear to be identical (to the casual observer). An asbestos specialist, however, looking under the same microscope at the same two strands of material would quickly see the difference between the inorganic thread and the organic one. He would show us that the inorganic asbestos has not the tiny barbed sides that the true silk has. The asbestos resembles a thin, polished rod, while the silk has rough edges. This peculiarity in the silk allows it to be drawn out to a very fine thread, the individual strands clinging together by their saw-toothed sides. Although asbestos may be drawn out and the fibre subdivided indefinitely (depending wholly upon the fineness of the tools used), it will not draw out into threads unless it is prepared before spinning.

Only the Crude No. 1 fibre can be used in spinning. The asbestos, coming from the cobbers, is crushed and recleaned. This long asbestos is then sent to a fiberizer where the fibre is opened and dust particles are shaken loose. The fibres are then mixed with cotton, the proportion of pure asbestos to cotton depending entirely upon the use to which the final product is to be put. The amount of asbestos varies between eight and twenty percent This mixing of asbestos and cotton must be very intimate. A mixing machine is used into which alternate layers of cotton and asbestos are blown. After mixing, an air blast conveys the cotton and asbestos to a carding machine. Carding consists in "teasing the mixture on a series of revolving

cylinders covered by strips of leather wound diagonally and fitted with close-set fine steel bristles"[15]/. This carding process combs the fibres and removes the "shorts" as well as waste. The carded mixture is next sent to a winding machine where the fibre is wound into long slender threads. The threads are then spun into cloth.

Most of the spinning fibre asbestos is used in the manufacture of brake band linings and clutch facings for the automobile industry. Over 70,000,000 feet of brake band lining were made in the United States during 1937. Other uses for fine spinning fibre are: gaskets, curtain cloth, stage scenery, blankets, mattresses, firemen suits and helmets, gloves, shoes, awnings, conveyor belts (for carrying hot materials), tapes, sheet-packings, wicks, and ropes.

Non-spinning fibre has an ever-widening variety of uses. It is used in heat insulation and roofing material, in moulded brake linings, pipe coverings, stove linings, car mufflers, radiator covers, millboard and electric switch boxes, fireproof paints, filters, battery boxes, and roofing shingles.

It is hopeless to attempt details regarding all of the asbestos products manufactured, but this small list will give the reader a good idea of the importance of the products manufactured from asbestos.

Chapter 8

CONCLUSION

Many books could be written on the history of asbestos and the ways that man has used it. The sudden emergence of asbestos from a mere myth to a vital factor in world affairs is nothing short of remarkable. Asbestos stands unique among the minerals of the day. It is not attacked by the action of acids or water, it can be spun, moulded, woven, or felted into thousands of useful articles.

A good idea of just how asbestos has contributed to the cause of civilization can be obtained by following the fibre from its original position in the ground to the final theatre curtain in the local cinema.

To get one ton of asbestos, it is necessary to blast a quarry and process over fifty tons of rock. Is it any wonder that the price for this mineral is so high?

Africa has a unique position in the asbestos field. A practically virgin country with huge reserves will probably continue to lead in world production for many years to come. Canada will still put out her share of this product, but with declining production. The United States will never be able to produce the valuable long fibre asbestos unless some startling discoveries are made in the future.

The world will probably not become deficient in asbestos for thousands of years, and when that time does come, we can rely on our scientists for substitutes.

15/ Ross, J. G., idem. p. 112.

An Interesting Tourmaline Specimen

We have in the offices of *Rocks and Minerals* a specimen of pegmatite, about 2 x 2 x 3 inches in size, from the Barrus Farm, Lithia, Mass., that contains tourmaline crystals in five colors. One of the crystals is quadri-colored (four-colored). The exterior of this crystal is dark brown, next is a thin zone of green, then dark blue which constitutes the main mass of a one inch crystal and imbedded in the blue mass is a tiny white tourmaline. This large crystal is broken so that a cross-section of it is plainly visible thus exposing the four colors.

The pegmatite specimen is made up chiefly of white albite and tourmaline crystals. In addition to the above tourmaline, which is the largest crystal, there are many small green tourmalines, some of which are gemmy. A few are dark brown, some also being gemmy. Others are bi-colored, dark blue inside and green outside; green inside and dark brown outside. Still another combination is deep bluish-black inside and green outside. Another is tri-colored; blue inside, then green and outside brown and all three gemmy.

Present also in the pegmatite was a tiny lustrous black platy ilmenite.

HUGE EMERY VEIN FOUND NEAR PEEKSKILL, N. Y.

By PETER ZODAC, EDITOR
Rocks and Minerals

An emery vein 50 feet wide and almost a mile in length, was found Sunday, September 24th, 1939, by Joseph DeLuca and the writer, when on a reconnaissance through the emery district near Collabaugh Pond, about three miles south of Peekskill. At one spot the vein outcrops in a vertical cliff 60 ft. wide and 30 ft. high; 200 ft. away it is again 60 ft. wide but 15 ft. high.

The emery deposits around Peekskill are but little understood. The general belief is, and especially among the operators, that emery occurs in surface pockets only and this seems to be verified by the large number of pits, generally small, which are scattered in all directions. No vein of any magnitude was known. Consequently the discovery of this enormous vein, 50 ft. wide and almost one mile long, is of more than passing interest.

One fallacy, that the emery in the Peekskill area was a surface deposit only, has been discredited through the discovery that underground veins were present.[1]

The second fallacy, that no large veins are present, is discredited above.

The emery deposits around Peekskill are segregated into five districts, of which the Toddville area is the best known, and practically the only one to be examined by visiting geologists. Thus it is that when five districts are examined and notes collaborated that more knowledge can be obtained from one visit to each district than five visits to one district, taking everything as equal.

1 New Emery Strike in Peekskill, by Peter Zodac. *Rocks and Minerals*. Dec. 1937, p. 372.

New Haven Mineral Club

Martin L. Ehrmann, mineral dealer and collector of New York City, will be the guest speaker at the regular meeting of the New Haven Mineral Club to be held Monday, January 8th, 1940, at 8:00 p.m., in Room 218, 19 Congress St., New Haven, Conn. Mr. Ehrmann will speak on some of his experiences in collecting.

Ohio Gemologists Hear Clayton Allbery

Ohio Gemologists hear Clayton Allbery
Members of the Northern Ohio Guild of the American Gem Society enjoyed a most pleasant evening on the 21st of November, 1939, during their regular meeting held in Case School of Applied Science, when Clayton Allbery, Secretary of the Guild, presented his translation of the interesting book Die Kleinebuch der Edelsteine.

Working with painstaking care, Mr. Allbery has produced a well written paper that brings out the poetic beauty of introduction, in a surprisingly smooth flowing manner for a translation.

Many new legends concerning the ancient use of Gems, as believed by the Germans, are included in the work, as well as some very practical knowledge not generally known or found in most English text-books.

After a brief business session conducted by Charles Carolyne, President, there followed a laboratory period when the nature of several unknown gems were determined.

Welcome guests were Mr. and Mrs. E. L. Brandau of the Haserodt jewelry store in Elyria, Ohio.

The next meeting of the Guild will be held during the month of January, the date to be announced later.

WILLIAM THEIS,
Publicity Chairman.

Alessi — Mineral Dealer

In the November, 1939, issue of ROCKS AND MINERALS, an item appeared on page 341 stating that there was no mineral dealer in Chicago, Ill. Though the windy city may be lacking an establishment that would be of great interest to mineral collectors, a much smaller city 19 miles to the west boasts of one. A. Joseph Alessi, a member of the Rocks and Minerals Association, residing at 430 S. Highland Ave., Lombard, Ill., has a large stock of fine minerals for sale and he would be pleased to have collectors call on him when they are in his giving them specimens form his own vicinity.

THE MASSIF

(Mt. Adams in Southwestern Washington)

By W. I. THROSSELL

Yakima, Washington

The sun-beleaguered valley of the Yakima, in late August, looked pleadingly toward the white, silent sisters, Mt. Rainier and Mt. Adams, hoping for a swish of cool air, thrown up from the Pacific, and dashed around their icy shoulders. But the elements were at peace. Mohammed's reasons for associating himself with the mountain is obscure, but his philosophy remains unchallenged.

Driven by the heat and pulled by curiosity, our trip to Mt. Adams is quickly accomplished. Hard surfaced roads approach to within fifty miles, another thirty over good gravel roads, and the remaining distance, from Trout Lake to Timberline Shelter Camp, is a steep, but fairly-well improved forest road.

As the distance decreases, the might and bulk of the peak increases until one loses some scepticism over the rumors and lore of mysterious mines and missing men. With his back turned to the mountain monarch, one may loose flamboyant denials, but facing its grim heights, reverence and awe cannot be denied.

One story that recently evolved out of that wilderness, had to do with a prospector who, it is said, accidently noticed a small hole at the base of a cliff, partially hidden by sliding earth. So well was it concealed that it might have remained unnoticed until completely obliterated. A prospector could hardly be expected to restrain his curiosity, so the rocks and earth were removed sufficiently to permit entrance. A small room and a tunnel were discovered. The tunnel slanted upwards. Using a flashlight, the prospector followed the shaft to a second room. This room was reached by a ladder, so rotted that great care had to be exercised to prevent injury. The room proved to be the former home of some miner. A mouldering, dust-covered skeleton occupied the remains of a bunk. Papers, scarcely legible, indicated a date previous to 1900. Little more information has been forthcoming because of the prospector's belief that sooner or later he will discover the dead miner's cache of mined gold.

Less spectacular, but a recently made stake in the vicinity, is one of a bed of sheet rock, labeled "andesite" by the discoverer. It is described as being "a combination of basalt and late-formation granite." The stone is said to lie piled in layers from one-half to four inches in thickness. Its strength was tested by a truck loaded with rock driven over a half-inch thickness, which sustained the load. Its usefulness is described as being a source for tiling and decorative facing for buildings; it takes a high polish of greyish brown color.

The Pleistocene epoch saw the birth of this monster, Mt. Adams, when vents which opened in the earth poured forth great volumes of volcanic material, heaping it nearly two miles in height, to raise it 12,307 feet above sea level. Evidence of its youth it seen in the unweathered condition which characterizes the volcanic rock on its slopes. Even the forest-covered expanse below the timber-line is underlain with rock of surprising freshness. Yet time allowed for the wind blown silt to cradle a now ancient forest.

At Timberline Shelter, base camp for climbers, a superb view is had of Mt. Hood and Mt. St. Helens, spawn of the same litter. Here the road ends and the trail begins—seven miles of it for a rise of some 6,000 feet to the summit, through deep tuff and loose scoria that shifts under foot; or across glaciers, and around boulders. A seasoned hiker would expect to make the climb in five hours in favorable weather, and the return trip in about two. Fortunately, a packer recently spent some time improving the trail, removing large rocks, and marking the best route. When snow covers the greater extent of the trail, it's a

East side of Mt. Adams as seen from Mt. Adams Lake.

seven hour struggle to the top, but only an hour's coast to the bottom. A large frying pan to sit in, adds to the sport of descending over the snow. Without such pants' protection, a permanent bleach and precarious thinness is attained.

And that brings us to the little known and startling fact that this mountain summit is negotiated by horses, a unique feature among snow-capped peaks. And right at Timberline is a corral inclosing tents, stacks of baled hay, and a string of strong, wiry horses.

At this moment, the horses appear at the lower end of the trail headed for camp. Each carries a pack of 150 pounds, but one or two break out of line, and all step briskly in their eagerness to be home. An examination of the contents of their packs, reveals the purpose of their labors, but the full explanation rests on the summit behind them.

The horses receive the first attention, before their master, the genial and generous Jack Perry, attends to his own appetite. His friendliness extends to chance visitors, to whom, when possible, he offers the use of the horses for easy trail rides during off-days, especially if the trip takes them into the rich, green grass areas where the horses can enjoy a few "fresh vegetables" as a treat from the dry hay.

These grassy areas represent the Alpine-meadow zone—the snow fields of the early spring. At their upper border, a sharp increase in the degree of rise marks the beginning of the avalanche and glacier zone, which in turn, ceases at the Artic zone—the ice cap.

After two or three days rest, the horses are loaded with supplies and headed up hill again. If the hiker starts well enough ahead of them, he may be invited by Jack Perry to hang on to the horses' tails for the last half mile. The usual schedule for the horses is to climb 100 feet and then be allowed a rest of about two minutes. It takes the horses 3½ hours to make the ascent.

To date, 147 trips have been made, representing 700 horseback loads taken to the summit. However, ascent by climbers of the hiker and tourist type is frequent during the summer. Observations of one week-end saw the peak conquered by eleven YMCA boys from Portland, a truck load of CCC boys, an elderly man and his seventeen-year-old daughter, and three hardened mountaineers, making a round of the northwest pinnacles. While Adams lacks something of the defiance and grandeur of Rainier, it is second only to that mountain in size among the northwest volcanoes. It is, however, the easiest to climb. If one wishes to test his climbing ability, he has only to select the east or west sides, instead of the south or north. There are few recorded triumphs from these directions. Even the most skilled need an ample supply of luck to make it. Sheer cliffs, and ice cascades block the way, crevasses increase the peril, and one night must be spent suspended on the perpendicular slopes.

After four years effort, the forest service finished construction of a look-out station on the dome of Adams, in 1921, but cloud caps and other unfavorable factors led to its abandonment. It is now listed as a shelter station.

The composition of the rocks, or lava, of this region is not unusual. Rather, it is characteristic of many similar volcanic occurrences. The rocks are light-colored for the most part, placing the group largely in the andesite type of lava which contains moderate amounts of iron and silica. However, certain other ridges, perhaps representing later flows from a lowered edge of the crater's rim, or a vent in the side of the volcano, are lighter in color, indicating a preponderance of silica over iron which might place it in the rhyolite type of lava. An analysis would prove the principal constituents to be silica, alumina, ferrous oxide, calcium oxide, sodium oxide, and potassium oxide.

Other distinct and separate lava flows are clearly basaltic, dark in color. Associated with these is the light weight cinder and froth which were scattered by wind, or floated along on the surface of lava flows.

It is probable that Adams would be one of the last to be troublesome in the event of an epidemic of eruptions along

the Cascade Mountain range, but indications are that she was never a very turbulent child. The breadth of her shoulders would indicate that her custom was to pour her offerings gently over the side.

Contrasting with her in this respect is Mt. Rainier about 50 miles to the north. A frenzy which seized her caused her to blow her own head off. This strange act resulted in the loss of 10% of her height. This fact has been ascertained through observation of lava strata at the base, which, when hypothetically extended shows its source to be at a point about 1,000 feet above the present summit crater. At present, the only signs of inner stress are the presence of gas and steam vents of slight extent.

One early writer imagined a prehistoric scene of startling grandeur could have been had by observers on the Pacific who could see at night a series of blazing volcanoes. Of course, were all the volcanoes active at one time, the phenomenon would have extended from the Bering Sea to the Straits of Magellan.

But it is doubtful if even the volcanoes of Washington performed simultaneously. Certain it is that action ceased on some far earlier than on others. It is recorded that Mt. St. Helens, about 30 miles west of Adams, was in eruption as late as 1842.

Perfection of Mt. Adams' moulding was somewhat destroyed by the course of glaciers, and the melting of an immensely thick ice coating which mantled her through the ice age. Disintegration continues though at a decreasing rate, as the extent of the glaciers grows less. Where formerly the glaciers covered all the slopes, now there are perhaps seven distinct and separate glaciers separated by sharp ridges of lava. Early reach of the glaciers is recorded on rocks as far as five miles below the summit. Also, there are rock ridges high up on the mountain that show no glacier markings, indicating a date much later than the ice age.

The looseness of structure has greatly facilitated the wearing of great gulches by ice and water. Huge masses such as the Castle standing high above the moraine bear witness to the extent of the cutting done by natural forces on the surrounding mountain side.

There are good days for climbing, as well as very disagreeable days. The amateur frequently returns with well blistered skin, and temporarily injured eyes. The experienced, or forewarned climber, greases his face and equips himself with sun glasses if the climb is made when snow covers the trail. However, in late summer, these precautions are not usually necessary. There are times, too ,when no premonition at the beginning of the climb, tells of the blizzards raging around the summit at the end of the trail.

There is one man who took all the weather as it came for a sixty-nine day endurance record at the top. The feat was not a notoriety stunt, however. His mission was to cook for a crew of men doing prospecting and assessment work for a mining company.

This mining claim probably holds some sort of a record geologically, situated as it is and considering its subject matter. And this results in an explanation of the pack train.

Sulphur has been found on about 200 acres of the 360 under the summit claim of the one company. There has been sufficient work done on 40 acres of this 200 to prove that an ore body exists of 841,571 long tons, 46% of which is pure sulphur, or 388,905 long tons. In the reports this 40 acres is referred to as the proven area. Another 40 acres has been partially prospected. The results obtained thus far indicate that a deposit similar to the proven area exists.

The remaining 120 acres from all surface indications have prospects of proving out as favorably as the above mentioned proven area.

This summary takes into consideration only the sulphur deposits, although in 1935, a deposit of alum was uncovered which underlies the sulphur. An engineering report states that it is reasonable to judge that the tonnage of gypsum and alum minerals stated in order of magnitude are present in greater quantities than that of the sulphur. Further, it is pos-

sible that deeper beds of ore may be found. The alum is even more widespread than the gypsum. It occurs in small amounts in sulphur-rich samples and increases in sulphur-poor samples. It is indicated that the alum deposit is the direct result of the elements working through the sulphur deposits above, and that the alum underlies the sulphur beds in greater quantities than that uncovered. The prospected alum ore bed, which is less than an acre in area, is estimated to contain 23,865 long tons of ore with 33 1/3%, or 7,100 long tons, of alum crystals. Since this deposit has the same dip as the sulphur bed above, it further indicates that the alum deposits underlie the sulphur beds, which bears out geological reports.

This deposit was prospected in the summers of 1931-34-35. In 1931, test pits were dug in the bared sulphur deposits of North Ridge, South Island and a few pits were dug through the ice cap. In 1934 a diamond drill was used to drill through the ice cap into the sulphur beds. Some 2,300 lineal feet of boring was completed; the top of the mountain surveyed and mapped. Outcroppings of sulphur were checked and crevasses explored and mapped. In 1935 six test pits were dug through the ice cap and through the sulphur beds beneath. Crevasses were rechecked and a tram survey run down both the southeast and southwest sides of the mountain to about the 3,000 foot elevation.

The present plan calls for mining the deposit by underground methods. A 600 foot tunnel has been proposed in order to reach the ore.

In the Northwest, sulphur finds its principal use in the paper and orchard spray industries. The lower grade sulphur ore, together with residue from the refining processes, find a use as a chemical fertilizer. Where necessary, according to the needs of the soil, additions of phosphate, limestone or potash are made.

But all the value of this area is not to be measured in dollars and cents. Less than two years have passed since the government set aside 153,000 acres on the western boundary of the Yakima Indian Reservation in the Mt. Adams region. The plan is to maintain the wilderness unspoiled by roads, or habitations. The country will be reserved for the exclusive use of the Indians.

Included among the scenic assets are an imposing array of peaks, including part of Mt. Adams, Goat rocks, Lakeview Mt., Red Butte, Potato Hill, Jennie Butte, and Midway Peak. Scores of beautiful little lakes are hidden away in the dense timber, including Mt. Adams Lake, Howard Lake, Two Lakes, Fish Lake, and Leconte Lake.

Fish abound in the lakes and streams where they are protected from white fishermen. Treaty rights remove any restrictions on fishing and hunting by Indians. Because of this, and because of inroads from sheep and cattle grazing, little game remains in the area, although a little control and propagation would soon restore it as a game paradise.

Timber species included in this region are Douglas fir, western yellow pine, larch, white fir, hemlock, western red cedar, western white pine, Alaskan yellow cedar, lodge pole pine, ponderosa pine, balsam fir, and Engelmann spruce.

The new arrangements do not interfere with present construction plans which involve building a road around the base of Mt. Adams. It does, however, leave the district without maximum forest fire protection. Men and equipment must be transported by horse to forest conflagrations.

The Mt. Adams country is not a new scene to the Indians. Before 1825, the region had long been a summer camping ground for the Yakimas, Nez Perces, Palouses Walla Wallas, Wascos, Klickitats and Cayuses. Here, in summer, they gathered to pick huckleberries, to hunt and fish. Even today, huckleberry fields are set aside for their exclusive use.

There is some doubt regarding the Indian name for Mt. Adams. Some say it was referred to as the "Klickitat" because it was in the home range of the Klickitat Indians.

Unfortunately for many beautiful Indian names, their places were usurped by

easier, homelier names more familar to the invading whites.

An early geographer attempted to establish the Cascades as the "President Range," naming its peaks after the presidents of the United States. John Adams was the only president so honored whose name continues to designate one of the peaks in Washington. Even after Mt. Adams was so named, various lexicographers attempted to establish different names for it, but, while they succeeded in elminating presidental names for the others, the persistence of the railroads in using the name of Adams, resulted in its eventual acceptance.

Lewis and Clark, in the account of their expedition, refer to it as "a very high, humped mountain."

The second recorded exploration trip across the Columbia territory was that made by Capt. George B. McClellan in 1853. He was scouting for a railroad route and his party left Fort Vancouver on July 22 of that year, going by way of Yocolt, and traveled up the "Calhlapoot'l" (Lewis River) from August 1st to 5th. McClellan commented, in his record, on the "dense forests of immense size." They continued on past Red Mountain and Goose Lake and Ahtanum and the Yakima country.

Fort Vancouver, lying just east of the present city of Vancouver, Wash., is the oldest continuous home of white men in the State of Washington, having been established in 1825 by Dr. John McLoughlin, the famous Doctor of the Hudson's Bay Company.

Mt. Adams is included in the Columbia National Forest established as a separate reserve in 1907, although previously included in the Rainier Forest Reserve, established Feb. 22, 1897.

Acknowledgement and thanks are extended by the writer to the forest service for maps and printed information, to Mr. Wade Dean of the Pacific Sulphur Mine of White Salmon, Wash., and to Mr. Joe Yolo of Yakima for the picture of Mt. Adams.

WORLD'S LARGEST CHRYSOBERYL CRYSTAL

What is believed to be the largest chrysoberyl crystal in the world was placed on exhibition December 4, 1939, in the mineral collection at Field Museum of Natural History, Chicago, Ill. Chrysoberyl is a rare accessory mineral in granite pegmatites, characterized by extreme hardness, being exceeded in this property only by diamond and sapphire, according to L. Bryant Mather, Jr., assistant curator of mineralogy. Certain varieties of chrysoberyl, which chemically is the aluminate of beryllium, are cut as gem stones known as alexandrite, cymophane or cat's-eye, and Oriental chrysolite.

The record size specimen now exhibited, and another exceptionally large specimen, were recently obtained from their discoverer, Richard V. Gaines, of the Colorado School of Mines, who found them near Golden, Colo. The specimens occurred among several hundred crystals, of which a number were larger than had ever before been found on this continent, or probably anywhere in the world. The larger of the two crystals at the museum measures 5 by 5 by 2½ inches, and weighs two and one-half pounds. The largest specimens previously to reach the museum did not exceed 2½ inches in its longest dimension.

NOTES FROM A COLLECTOR'S DIARY

By M. ALLEN NORTHUP

Morristown, N. J.

MAY 30, 1939. Visited the so-called Prospect Park quarry outside of Paterson, New Jersey, arriving just in time to see them shoot a blast, but only had a little while during lunch hour to collect before the men went back to work. The usual amount of calcite, and a little amethyst of good color, but poor crystal form, were found, and not much else excepting an outstanding group of crystal cavities after anhydrite. A radiated group of very large anhydrite crystals which diverged like the fingers of a spread-out hand had been thickly crusted over the ends with quartz crystals, and later the anhydrite had been dissolved away. This left a group of sparkling quartz crystal molds which might easily be mistaken for a magnificent specimen of white prehnite, if there is such a prehnite.

JUNE 15, 1939. Spent the day at the Scherrer serpentine and talc quarry north of Easton, Pa., in the company of Fred and Ed Schneider of the Queens Mineral Club. Many fine specimens of the rare minerals, thorogummite and thorianite, were found as well as a little uranophane. The real finds of the day were a 4"x6" piece of serpentine heavily coated with molybdenite, and a perfect 2" pseudomorph of serpentine after a pyroxene crystal imbedded in orange calcite. Several well-developed, but tiny titanite crystals were brought to light in the vicinity of the pegmatite which juts up into the serpentine at the center of the quarry. Tremolite was plentiful, occurring as long white fibers, coarsely radiated pale green groups, and light grey cleavage masses. Two-inch muscovite crystals were also found, both unaltered, and partly changed to serpentine, which causes them to have a more pearly luster, and makes the plates less elastic. All in all, the day was very successful, but would have been improved by a dip in the near-by Delaware River. However, bathing suits had been left at home, and as the spot was not too well shaded, we had to forego the pleasure.

JULY 9th, 1939. Stopped in for a little while at the Kinkel feldspar quarry in Bedford, N. Y., but saw little of interest. However, on the way out a chunk of rose quartz was picked up off the dump pile. This piece which was about 4" long and 2" thick, had two plane surfaces running part of the length. Immediately the conclusion was jumped to that here, at last, was that rarest of all quartz family minerals, a rose quartz crystal, and there was great rejoicing. The new find was scrutinized very carefully, it being noted that one of the "faces" was moderately smooth, but entirely unstriated, while the other one, which seemed to be an adjacent prism face, was uniformly smooth and dull. This didn't seem quite right, as all the prism faces on quartz are usually bright with striations running across. The faces of the terminal rhombohedrons, however, are sometimes alternately bright and etched, but this possibility was ruled out by the fact that the angle on a new "crystal" was found to be 126° (with a contact goniometer) which does not agree with the theoretical one of 133°44' for these two faces. Similarly, the angle between two prism faces is 120°, or between a prism face and the rhombohedral one above it, 113°8'. There are no other faces listed for quartz which have an angle of 126° and which would be at all likely to occur in such size without striations. It was therefore, concluded that the plane faces were due to contact, probably with a large feldspar crystal, at the time the quartz formed. The specimens was nevertheless placed in the cabinet as a fine example of the fact that all that glitters is not gold (or rose quartz crystals).

AUGUST 8, 1939. Spent vacation in West Pittston, Pa., again, and took a look at the Sullivan Trail Coal Co. mine, but didn't find anything as they've been cleaning coal from several other mines at their breaker; so the dumps were covered

with rock that had been through the hydraulic cones. This practise is now pretty general in the region and practically ruins mineral collecting. However, a little new shaft was found across the highway from the Volpe Colliery outside of Pittston, where there was a small pile of run of mine rock. This yielded several excellent specimens of millerite in long fibers lying loosely on vein quartz. The millerite became detached from one of these on the way home, and from another in bringing it back to New Jersey; so that the net results left something to be desired. However, three new minerals for this region were found, which helped to make up for the lost millerite. These were: galena in 1/8" to 1/4" cubic crystals on quartz, a large specimen of stalactitic marcasite filling the center of a quartz vein, and a thin crust of radiated fibrous aragonite on sandstone. The marcasite is especially interesting because of its comparatively recent formation, and the absence of secondary pyrite. Much of the pyrite found at the mines in this region is probably mixed with marcasite, but this is the first time that a good type specimen of the latter had been found. Some of it is penetrated by millerite, which also serves to show that the marcasite is of recent formation. Unfortunately, the specimen is about half altered to melanterite at present and is evidently not long for this world.

Small quartz crystals and thin coatings of chlorite were also abundant at this mine, as well as tiny crystals and grains of black sphalerite. The latter again brings up the question of where the metals came from originally, as lead, zinc, nickel, and minute traces of copper (chalcopyrite) are not ordinarily thought of as being present in coal ash, or the light-colored sandstones in which the coal occurs. However, there is no evidence of igneous rocks anywhere in the region; so that it would seem that the metals must have been leached out of either the coal or the country rock.

SEPTEMBER 16, 1939. Took half a day off to visit an old favorite locality, namely the Commonwealth Trap Rock Quarry at Summit, N. J., but spent so much time at No. 3 that the other workings had to be left for next time. About the usual amount of prehnite and datolite coating little cavities in the trap rock was seen. This datolite often occurs in diamond-shaped crystals, tabular parallel to the orthodome which is usually etched, striated, or partly altered, detracting from the brilliance of the specimen. A few crystals up to 3/4" were found, as well as a very nice group of the less common pink ones. The find of the day, however, was pectolite, which was new to the writer at this locality, except as thin coatings of stevensite, the alteration product. Three 4" pockets filled with the mineral were discovered in the middle of very large pieces of perfectly fresh trap rock which had evidently protected the pectolite from destruction by circulating ground water. It consists of little fan-like groups of radiating, snow-white fibers, growing together every which way, and forming a very tough and compact filling in the cavity. Like most pectolite, it was difficult to chisel out of the rock and did a fine job of getting stuck in the fingers, which properties, together with the appearance, are sufficient for identification. Just to make sure, however, some fibers were separated and examined with a 20X lens which showed them to have a flat rectangular cross section (difference from natrolite which would be square). The specimens were also tested for triboluminescence by scratching gently in the dark with the point of a knife. The production of yellowish white sparks positively differentiates pectolite from natrolite, thomsonite, and scolecite, none of which possess this property, although they resemble pectolite superficially.

Another typical trap rock mineral not previously noted at this locality is hyalite which was found in rather extensive patches coating jointing planes in rock at the far end of the quarry. The mineral consists of a thin, slightly mammillary, crust with a pearly luster, and differs from the pegmatite occurrences in

being white and in not fluorescing under the argon bulb.

Just to add interest to the day's collecting, a mystery mineral was also found. This looked more like plaster of Paris than anything else, and filled a small pocket in one of the large pieces of trap rock containing pectolite. It was slightly greyish white except in straight parallel cracks which were coated with a film of limonite. It adhered slightly to the tongue, but was too hard for kaolin, being difficult to scratch with a knife and scratching glass itself when large pieces were tested. Ordinary laboratory tests made a few days later drew a complete blank, the mineral was finally boiled in hydrofluoric acid in a last attempt to take it apart. This treatment dissolved it completely, and almost no residue remained when the solution was evaporated to dryness, indicating that the specimen was practically pure silica, though how it got into such a form is a mystery. There is a possibility that it had originally been intimately mixed with datolite which later weathered out leaving spongy silica, but the freshness of the surrounding rock and the uniform fine-grained texture of the mineral argue against this. The uniformity also makes it unlikely that the silica had been frothed up by hot gasses in the rock before it solidified. The writer has never seen anything quite like it and can only compare it to an agate that failed to jell.

Speaking of agates, a grey and white banded one about 2" in diameter was also found, but it was too opaque and dull to be worth polishing. However, it is the best so far from this quarry.

BARNEY BALLEW

Robert Barney Ballew, better known as Barney, died at his home on Crabtree creek, near Little Switzerland, N. C., on Friday, November 10th, 1939, after an illness of about six months.

Barney will be remembered by the readers of ROCKS AND MINERALS for the great quantities of beautiful hyalite which he handled. This hyalite was known as "Little Switzerland hyalite," and was obtained from the many feldspar quarries along Crabtree creek. Mr. Ballew made a specialty of this hyalite, shipping it to all parts of the United States and many foreign countries, until it became the standard by which all hyalite was judged. Some of this hyalite was mined by Mr. Ballew, himself, and much of it he purchased from the miners of the district, paying them fair prices. His product was always in demand and quantities were sold to dealers, and individual collectors, he exchanged enough of this material however to build up the best collection of foreign minerals to be found in this section.

Mr. Ballew was a veteran of the World War, 46 years of age, and had conducted a country merchantile business since his discharge from the service. For some time he was also engaged in a wholesale grocery in Spruce Pine, and at intervals, operated feldspar mines. Burial services were conducted at a little family cemetery at the foot of Celo mountain, in Yancey County, and was attended by American Legion members and a host of other friends from a widely scattered area.

Mr. Ballew was always generous with visitors, conducting them to mines, and helping them to gather specimens of the district. He helped many beginners by giving them specimens from his own collection.

Survivors of Barney's own family are his widow, Mrs. Ethel Ballew, and two small children, Lillian, and Sherrill. It is understood that Mr. Ballew willed his mineral collection to the little girl, Lillian, age seven. Rocks and Minerals Association, and the local community, have lost a valuable member in the death of Barney Ballew.

TWO NEW MINERALS FOUND IN CALIFORNIA

During 1938 California added two new mineral species to its already long list of over 420 different minerals, not counting varieties, found within it's boundary. To date 54 minerals have been first discovered in California and of those 41 have never been found outside of California.

Working in the laboratories at Trona on Searles Lake, San Bernardino County, William E. Burke, in 1920, prepared for the first time a new chemical compound of sodium borate chloride with water. Eight years later John Teeple in his book, *THE INDUSTRIAL DEVELOPMENT OF SEARLES LAKE BRINES,* prophesied that years later when Searles Lake had dried up a mineralogical name for this new double salt would be needed. It was for this reason and in recognition for his work done on the chemistry of Searles Lake brines that the name TEEPLEITE has been accepted for the salt discovered in nature by Mr. M. Vonsen of Petaluma, in Borax Lake, Lake Co., California, during the summer of 1934 at which time the lake was nearly dry due to light precipitation during the year and the prolonged desiccating effect of the sun.

TEEPLEITE is a hydrous double salt of sodium metaborate and sodium chloride, being represented by the formula: $Na_2B_2O_4.2NaCl.4H_2O$. It occurs in buff colored, flat bladed tetragonal crystals grouping together to form rosettes assuming a botryoidal structured crust. It replaces halite cubes associated with trona. Halite, borax, pirssonite, gaylussite, sulphur, hydrotroilite, and northupite are other minerals that were found in Borax Lake in 1934. The trona is fluorescent and phosphorescent, as is the brine.

Recently Mr. Bandy discovered a new mineral while collecting in the copper mines of Mina Quetena near Calama, Chile. This new specie, named bandylite, is closely related to teepleite as is shown in the two formulas:

Teepleite $Na_2B_2O_4.2NaCl.4H_2O$.
Bandylite $CuB_2O_4.CuCl_2.4H_2O$.

(Note: This is the second new borate mineral first discovered by Mr. Vonsen. His first discovery is known as vonsenite, a magnesium and iron borate, from the Old City Quarry, Riverside, Calif., found in 1920).

The other new California mineral belongs to the group of borates; however it is a member of the colemanite family being a hydrous calcium borate. It has been named VEATCHITE in honor of Dr. John A. Veatch who was the first man to detect the presence of boron in California waters in 1856. The mineral was found by William Nisson at the old Sterling Borax Mine 5 miles north of Lang, in Tick Canyon, Los Angeles County, in 1936. Veatchite occurs as silky fibres in a mixture of howlite and limestone. Other minerals to be found at the mine are ulexite, colemanite, probertite, and calcite.

The following table shows the chemical relation of veatchite in the colemanite system:

Veatchite	$Ca_2B_6O_{11}.2H_2O$.
Colemanite	$Ca_2B_6O_{11}.5H_2O$.
Hydroboracite	$(Ca,Mg)B_6O_{11}.6H_2O$.
Meyerhofferite	$Ca_2B_6O_{11}.7H_2O$.
Inyoite	$Ca_2B_6O_{11}.13H_2O$.
Inderite	$Mg_2B_6O_{11}.15H_2O$.

Inderite is a newly discovered borate from the Inder borax mines, Inder, Russia. Parahilgradite and hilgardite are two new minerals recently discovered from Choctaw Salt Domes, Iberville Parish, Louisiana, and are somewhat related to the colemanite group of minerals, $Ca_8(B_6O_{11})_3.Cl_4.4H_2O$.

Zoned Mica From Connecticut

Two very interesting zoned mica (muscovite) specimens were given to us by Mr. Merton McKown, a member residing in South Ozone Park, N. Y. The micas are colorless though slightly stained brown in places by limonite, and quite heavily zoned in green. One of the specimens is so zoned near one edge as to depict a skyscraper of about 30 stories in height.

The specimens were collected at Bill's Dam, near Pleasant Valley, Conn.

Club and Society Notes

Club Publications

It is a source of much pleasure and gratification to note the large number of bulletins which are regularly issued by mineral clubs throughout the country. Though many of these bulletins consist of but one page, they contain a lot of interesting notes and news items that are of much value to mineral collectors.

Among the clubs which have *Rocks and Minerals* upon their mailing lists are: The East Bay Mineral Society, Oakland, Calif.; Northern California Mineral Society, San Francisco, Calif.; California Federation of Mineralogical Societies, (Mineral Notes and News, Paul VanderEike, Editor, Bakersfield, Calif.); Colorado Mineral Society, Denver, Colo.; New Haven Mineral Club, New Haven, Conn.; Maine Mineralogical and Geological Society, Portland, Me.; Boston Mineral Club, Boston, Mass.; Plainfield Mineralogical Society, Plainfield, N. J.; and the Queens Mineral Society, Long Island, N. Y.

Club Exhibits Minerals

Two very interesting exhibits of commercial minerals, one temporary (Strategic Minerals) and the other permanent (Economic Minerals) have recently been placed on display in the Public Library, Plainfield, N. J., by the Plainfield Mineralogical Society.

The exhibit of Strategic Minerals is designed for the mature or adult mind in particular and especially for those indivduals interested in our national defense. The collection, arranged in the Current Events Display Case, is on display in the main reading room of the library and is attracting considerable attention and interest, according to the librarian whose desk is only a few feet away from it. A four-page typewritten text giving much valuable information on the minerals displayed is on the case and adds to the interest of the exhibit.

The permanent exhibit of Economic Minerals is on display in the Meeting Room of the Club (the Map Room of the library). This exhibit is designed not only for the benefit of the Club's members but even more so for the edification of the pupils of local and nearby public, parochial and private schools, boy and girl scouts, etc.

This is a most commendable effort on the part of the Plainfield Mineralogical Society to bring mineralogy before the eyes of the public in general and young people in particular. We hope that clubs in other cities may follow the example of this public-spirited society and will exhibit minerals in their cities if they have not already done so.

Ehrmann Address Plainfield Club

Martin L. Ehrmann, of New York City, world-wide traveler, mineral dealer and collector, was the guest speaker of the Plainfield Mineralogical Society at their regular meeting held Tues., Dec. 5, 1939, at the Public Library, Plainfield, N. J. His subject was his recent trip to Mexico after minerals which he made accompanied by Dr. Wm. F. Foshag, Curator of the U.S. National Museum, Washington, D.C.

Mr. Ehrmann's talk was most interesting, educational and entertaining. He related at length visits to important mines, their history, what had been produced along mineralogical lines and what they collected. Now and then he interspersed his talk with amusing tales that set the large group present roaring with laughter. But when he began to state how cheaply one could live in that interesting country south of the Rio Grande—that 25c a day would cover food, lodgings and visits to mines—there was a flurry of arms dragging out note books and pencils and the jotting down of some items which only their writers knew what. A few minutes later there was another flurry among the audience—items being crossed out or erased—following Mr. Ehrmann's statement that at one locality where they had stopped for a week or so, their food was—beans and eggs for breakfast, beans and eggs for dinner, beans and eggs for supper. (Did Mr. Ehrmann have the group sold on a mineral trip to Mexico and then spoiled it all by his last statement? This is a riddle whose answer we will never know).

Mr. Ehrmann's talk was illustrated with slides and colored movies,, operated by O. Ivan Lee. Mr. Thomas Wright was the presiding officer with Mr. Joseph D'Agostino at the Secretary's desk.

Plainfield Mineralogical Society

The following program is scheduled for the month of January, 1940.

Tuesday, January 2, regular monthly meeting. Guest speaker will be Arthur Montgomerv, of New York City, who is beyond doubt, the most famous field collector in the Western Hemisphere. His subject will be "Gem collecting on Mt. Antero, Colorado" and will be illustrated with lantern slides.

Sunday, January 14, special educational meeting and talk for school children by Jack Boyle of the Brooklyn Children's Museum.

Saturday, January 20, field trip to Princeton University Museum, Princeton, N. J. A talk will be given at the museum by Prof. H. H. Hess.

The meetings will be held in the Public Library, Plainfield, N. J.

NEW YORK MINERALOGICAL CLUB—MEETING OF NOVEMBER 15, 1939

The meeting was called to order by President H. R. Lee at 8:15 P.M. with 64 members and guests present.

Mr. Northup, the chairman of excursion committee, reported on the Election Day trip to Vandermade's and Braen's trap rock quarries in Paterson and Hawthorne, New Jersey. The outstanding finds of the day were pulverulent Greenockite and large Babingtonite crystals. (Vandermade's Quarry). Other minerals found were: Prehnite, Datolite, Quartz (clear Xls, smoky and amethystine) Stilbite, Heulandite, Calcite, Chrysocolla, Chalcopyrite, Chlorite, Hematite and Agate. About 40 members attended and the collecting was found to be much better at Vandermade's than at Braen's quarry. Specimens of Prehnite, Amethyst, Greenockite and Babingtonite collected on this trip were exhibited by Mr. Northup.

Mr. Taylor requested members in arrears with their dues to see him as soon as possible.

Mr. Stanton requested Mr. Trainer to register a complaint to the Academy because notice of these dinners no longer appears on the bulletin.

President Lee introduced Mr. Martin L. Ehrmann, the speaker of the evening, who described a trip he and Dr. Wm. F. Foshag took to Mexico during the past summer. A resume of the trip is as follows:

They stopped first at Hot Springs, Arkansas, to inspect the quartz crystal locations. It was found that the crystals occur imbedded in clay in the hills for about 50 miles around Hot Springs and are dug out by the natives for sale to tourists.

Their first stop in Mexico was at a lead mine in Ojuela, State of Durango. This mine at one time produced 1/3 of the world's supply, but is now operated under sub-lease on a much reduced schedule. Splendid white Hemimorphite (Calamine) and Scorodite in ½" transparent greenish crystals were found at this locality as well as smaller amounts of Carminite.

An attempt was next made to visit a sulfur mine outside of Bermallio—but the mine was not working at the time and the roads in that section were found to be impassible due to heavy rains, so the attempt was given up.

The next stop was the Cerro Mercado (Iron Mountain) Hematite mine at Durango—where many Apatite crystals were collected. Hematite of 65% Fe content is being mined here by primitive quarrying methods. The greenish yellow transparent Apatite crystals occur imbedded in a mixed Semiopal—Chalcedony—Sepiolite matrix.

The Sombriete Silver mine which used to produce fine ruby silver was visited but as the mine was not working, no specimens were found. This was also the case with the La Luz and other silver mines around Guanajuato where fine Calcite, Apophyllite, Amethyst and Pyrargyrite were formerly found.

The famous occurrence of Opal in rhyolite at Queretaro was also unproductive, as was the silver mine at Pachuca.

However, very fine Mimetite crystals and fair Scorodite were found in a silver mine at Tasco, 100 miles south of Mexico City. This is reported to be the largest silver mine in the world and has been in operation since 1524.

Colored motion pictures of the entire trip were shown.

Mr. Grenzig reported that Mr. Niven had found an unusal flexible sheet Chalcedony in one of the mines at Guanajuato about 25 years ago.

Mr. O. Ivan Lee exhibited a specimen of artifiicial zincite crystals which are remarkable for their perfection and the large number of forms present.

Mr. Taylor described an inspection trip made during the past summer to an argentiferous Galena prospect in Colorado, which he had thought of purchasing. The description given to him was found to be without foundation in fact. Specimens of Galena were collected at the mine as well as Gypsum in Kansas and Fluorite in Colorado on his return trip.

. . Collectors' Tales . .

By PETER ZODAC

DEATH VALLEY PLAYS A TRICK

Once in 1935 while George Switzer and Wm. Nisson, both of Petaluma, Calif., were camping in Death Valley, also in California, they used some large rocks that happened to be prominent near their camp to construct a fireplace. Vigorous hiking, serious swinging of their single-jack hammers digging out meyerhofferite, and the desert air had created in them an overwhelming appetite so that in no time at all they soon had the fireplace built and a roaring fire cooking their dinner. All of a sudden there occurred in the fire some rapid explosions like a string of firecrackers when set off. The frying pan began jumping about over the fire like a jitterbug in action and settling all about them was a fine white dust. For a moment the two collectors looked at each other in amazement and then suddenly they both broke out laughing. For in their hungered-hurry they completely forgot that the colemanite "rocks" used in building their fireplace had the very peculiar characteristic or prodigious decrepitation when placed in a strong flame or fire. The dust from the decrepitating colemanite nearly ruined their dinner but the experience taught them a good lesson. From then on, they were very critical in choosing rocks or minerals that were *not* known to possess explosive characteristics when constructing a fireplace.

A peaceful Death Valley Mineral on the rampage.

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